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### (54) Local communication bus system and apparatus for use in such a system

Gerät eines lokalen Bus-Kommunikationssystems

Dispositif pour système de communication locale pour bus

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(56) References cited:  
**EP-A- 0 315 158** **EP-A- 0 369 382**  
**DE-A- 3 815 560**

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- **R.A. PIETSCH "Dimensia: The next dimension of sight and sound" RCA Engineer, July/August 1985, pages 66 - 70**

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**Description**

[0001] The invention relates to a local communication bus system comprising a serial control bus attached to a plurality of addressable devices, each device including at least one functional element addressable via the bus as a subdevice, the subdevices in the system including a user output subdevice for displaying status information of one or more devices of the system to a user of the system and a first control subdevice for initiating the display of such status information, the first control subdevice including means for generating a device information request message addressed to a device different from the device which contains the first control subdevice, and the addressed device including a second control subdevice responsive to such a request message for determining the required status information; wherein the second control subdevice is arranged to compose a formatted user-readable message and transmit the user-readable message directly or via one or more other control subdevices of the system to the user output subdevice for display.

[0002] The invention further relates to an apparatus for use as an addressable device in such a system.

[0003] A known serial control bus for interconnecting domestic audio and video apparatuses is the Domestic Digital Bus (D2B) Standardised by the International Electrotechnical Commission (IEC). An apparatus including D2B interface and on screen display (OSD) of status information is available in the United Kingdom in the form of Philips' 2070 colour television receiver. In the known apparatuses, the displayed status information is limited to information on the status within the apparatus itself. While it is known for another apparatus, for example a VCR, to superimpose status messages on its video output for display to the user via a television screen, again the content of the user messages is limited to status within the apparatus initiating that message. Furthermore, and particularly when apparatuses of different manufacturers are used together, there is no guarantee that the on-screen messages of one apparatus will not conflict with those of another, and it is not desirable, for example, for a satellite tuner to superimpose status messages on its video output signal when the latter is being recorded by a VCR.

[0004] Another problem that arises in obtaining status information, either in the form of user messages or in machine-readable form for internal control purposes, is that status can change in response to a variety of events. For example, a tape deck in a fast wind or play mode will stop when the end of the tape is reached. While the known bus system allows status to be monitored by polling of devices and subdevices with frequent request messages, the amount of bus traffic (requests and replies) involved in such polling renders it impractical for widespread use in a system of more than a very few subdevices.

[0005] An example of the system as set forth in the

opening paragraph is given in German patent application DE-A-3815560 and "Dimensia : The Next Dimension of Sight and Sound" by R. A Pitsch, pub. RCA Engineer 30-4, Jul./Aug. 1985.

[0006] It is an object of the invention to enable improved status information facilities to be implemented in a system as set forth in the opening paragraph.

[0007] The invention provides a local communication bus system as set forth in the opening paragraph, characterized in that the first control subdevice is configured to include in the device information request message a field specifying a format for the user-readable message, and in that the second control subdevice is responsive to the format-specifying field to compose the user-readable message in accordance with the specified format.

[0008] The first (initiating) and second (addressed) control subdevices can be in different apparatuses, and the user output subdevice can be in one of those apparatuses or a third apparatus. Moreover, the distributed control characteristic of a bus such as D2B allows more than one control subdevice to act as the initiating and the addressed subdevices at different times. The invention enables the initiating control subdevice to ensure that status information from a number of different devices can be displayed as desired in a coherent manner, without conflict.

[0009] In a preferred embodiment, the second control subdevice transmits the composed user message to the first control subdevice, and the first control subdevice relays the user message to the user output subdevice. The initiating control subdevice may thus combine or substitute the user message from the addressed control subdevice with user messages of its own and/or user messages acquired or received from further addressed control subdevices, and transmit the combined user message to the user output subdevice for display.

[0010] Flexible definition of the message format in the manner of the present invention allows the first control subdevice to dictate the size of message required, and in particular allows the fullest possible exploitation of the user message facilities throughout the system, even though the individual devices may have widely different capabilities.

[0011] The first control subdevice may be further arranged to specify, in such a field in the device information request message, the format of the desired user message by a number and length of lines of characters, and by reference to a specific character set. The number of possible message formats should be limited, to simplify the composing task of the addressed control subdevice. The specification of different character sets facilitates the production of user messages in languages appropriate to the user. The second control subdevice may be responsive to an available formats request to return a list of user message formats that can be composed.

[0012] The second control subdevice may further include means responsive to a change in status within the

system for composing and transmitting an updated user message without the need for a further information request from the first control subdevice. This too enables the user to be informed of changes in device status (channel changes, end of tape, etc.), while avoiding the heavy bus traffic that would result from continuous polling of the addressed device. The first control subdevice may further be arranged to include in the device information request message a field specifying whether or not updated user messages are desired.

[0013] Since the second control subdevice must remember the address of the first control subdevice which has requested updated messages, and since more requests might be outstanding at a given time than the second control subdevice has room to remember, it is advantageous if the first control subdevice includes means for generating a verification request addressed to the second control subdevice, the second control subdevice being responsive to the verification request message to generate a message advising whether updated user messages will be generated.

[0014] The second control subdevice may include means for generating a subdevice status request message addressed to a further subdevice in the system, while the further subdevice includes means responsive to the subdevice status request message for returning a subdevice status message to the second control subdevice for use in composing the user message.

[0015] The further subdevice might be in any apparatus of the system so that, for example, a television on-screen display could inform the user not only that it is displaying a picture received from a separate satellite broadcast tuner, but also which channel is selected in the tuner.

[0016] As with the device information request, updated subdevice status messages may be made available automatically in response to changes in status, and these in turn can trigger the composition of an updated user message by the second control subdevice, if a request for updated messages is outstanding.

[0017] The invention further provides an apparatus for use as an addressable device in a system as claimed in any preceding claim, the apparatus including an interface enabling connection to a serial control bus and at least one functional element, the functional element being addressable via the bus, as a control subdevice said subdevice comprising means coupled with the interface to receive a device information request message transmitted via the bus; means responsive to such a message to determine certain status information of the device for communication to a user of the system; means arranged to compose a formatted user-readable message conveying the said status information; and transmission means operable to transmit the user message directly or via one or more other control subdevices coupled to the bus to a user output subdevice, addressable via the bus, for display thereby; characterised by means responsive to the specification of a format for the

user-readable message in a field of the device information request message to compose the user-readable message in accordance with the specified format. The control subdevice may further include means for acting as the first (initiating) control subdevice of the system, that is to say, means arranged to generate and transmit via the bus a device information request message addressed to a control subdevice in a different apparatus coupled to the bus.

[0018] It should be appreciated that the subdevice status request message can be used to obtain status information for control purposes not necessarily connected with the provision of user-readable messages, and is the subject of a separate United Kingdom patent application filed after the priority document of the present application and from which together with this priority document EP-A-0 510 739 claims priority.

[0019] Embodiments of the invention will now be described, by way of example, with reference to the accompanying drawings, in which:

Figure 1 shows audio/video entertainment apparatuses forming a local bus communication system constructed in accordance with the invention, and Figure 2 illustrates operation of the system providing on-screen display of status information.

[0020] Figure 1 shows a domestic video entertainment system comprising a satellite broadcast tuner 10, a video cassette recorder (VCR) 12 and a television receiver 14, all connected to a serial data bus 16. Video and audio signals are passed within and between the devices 10, 12, 14 using, for example, SCART (Euro-connector) plugs, sockets and multiwire cables.

[0021] The serial data bus is in this embodiment a Domestic Digital Bus (D2B) as standardised by the International Electrotechnical Commission (IEC), Geneva, to be published in their document 1030 and previously available in draft form. D2B provides for distributed control of the bus, and allows commands and other messages to be uniquely addressed for specific "devices", such as the apparatuses 10, 12 and 14, and also for specific "subdevices" within each device.

[0022] Within each device 10, 12, 14 there are shown blocks representing D2B subdevices. The division of a device into subdevices is necessary only in a logical sense, that is to say, from the point of view of its behaviour relative to the serial bus 16. In the physical implementation of the device, there may or may not be corresponding separate physical subdevices. In fact, in the embodiment shown, each device includes one audio/video controller (AVC) type of subdevice which provides the control and systematic interrogation intelligence for all subdevices within that device, relaying D2B messages to and from those subdevices as indicated by the dotted data paths in Figure 1. The AVC subdevices also provide the (distributed) controlling logic of the system as a whole, interpreting user commands and controlling

the operation of the system accordingly. Often, the control logic of the AVC and some or all of the other subdevices will be integrated using a single programmed microcontroller. Other subdevices not shown in Figure 1 will generally be included in such a system, including timers, audio amplifiers, and so forth, and the video-related subdevices described herein are presented as a representative sample only.

[0023] In the satellite tuner device 10, a tuner subdevice 26 (TUN) performs the signal processing functions necessary to provide baseband video signals on a signal path A, while the AVC subdevice 20 receives user instructions from a user input/output subdevice 27 (UIO) and D2B messages from the bus 16, and operates to select channels, keep track of preset channel selections and so forth.

[0024] The VCR device 12 includes its AVC subdevice 22, and also a user input/output subdevice 29 (UIO), or terrestrial broadcast tuner subdevice 28 (TUN), a switchbox subdevice 30 (SB) and a videotape record/replay deck 32 (DCK). The recording medium itself is indicated at 34. The signal path A is connected via a first external (SCART) connector 36 of VCR device 12 to an input of the VCR's switchbox subdevice 30. A second external connector 38 of the VCR device is also connected via a signal path B to the switchbox subdevice 30, for example to allow connection of a videodisc player, or a second VCR. The terrestrial tuner subdevice 28 supplies a video signal to the switchbox 30 via a signal path C, and the deck subdevice 32 supplies a video signal to the switchbox 30 via a signal path D. The switchbox 30 supplies video signals via a signal path E to the deck 32 and via a signal path F to a third external connector 40 of the VCR device 12. The processes of reading and writing signals on the tape 34, within the deck subdevice 32, are schematically represented by video signal paths G and H respectively.

[0025] The television receiver device 14 includes its AVC subdevice 24 and also a user input/output subdevice 41 (UIO), a terrestrial tuner subdevice 42 (TUN), a switchbox subdevice 44 (SB) and a video monitor subdevice 46 (VID). The television receiver device 14 has two external (SCART) connectors 48 and 50 for supplying video signals to the switchbox 44. The connector 48 forms part of an unused video signal path J, while the connector 50 is connected to the third external connector 40 of the VCR device 12, and thus the video signal path F extends from an output of the switchbox 30 in the VCR to an input of the switchbox 44 in the television receiver device 14. A video signal output of the tuner subdevice 42 is connected to further input of the switchbox 44 to form a signal path K. A first video signal output of the switchbox 44 is connected to an input of the video monitor subdevice 46 (signal path L). The UIO subdevice 41 of the television receiver includes an on-screen display (OSD) function, as described hereinafter.

[0026] In operation, the tuner subdevices 26,28 and 42 can be regarded as sources of video signals with in

the system. The video monitor subdevice 46 can act as a destination for video signals, and functions to display images to the user, as indicated by the dotted output path M. The record/replay deck subdevice 32 can act as a source and/or a destination of video signals, depending whether it is playing and/or recording at a given time.

[0027] Since the functional elements within the apparatuses 10,12,14 are addressable as D2B subdevices, any of the AVC subdevices 20,22,24 can take control of the bus and address commands to those subdevices. This is done for example by an AVC subdevice which has been informed of a user command by a UIO subdevice and requires control of subdevices at various points

15 in the system to implement the user's wishes.

[0028] D2B message formats for controlling the basic functions of certain common subdevices are defined already in the IEC standard referred to above, while scope is left for defining not only new commands, but also request and reply messages that enable one D2B device or subdevice to interrogate another as to its properties and status. Each switchbox subdevice 30 and 44 can be controlled via the bus (or by its associated AVC subdevice) to connect its output data paths(s) a specified one of its input data paths. For example, if a user indicates to the television receiver device 14 that it is desired to watch a certain satellite broadcast channel, suitably addressed and coded D2B messages can be sent via the bus 16 to ensure that the satellite tuner 10, VCR

20 12 and the television 14 are active, to cause the satellite tuner 10 to select the appropriate channel, to cause the VCR switchbox subdevice 30 to connect signal path A to signal path F, and to cause the television switchbox subdevice 44 to connect signal path F to signal path L.

25 There are many ways of arranging these events with or without user intervention. For greatest user-friendliness, the whole process can be controlled by the AVC subdevice of the device which receives the user input. The information necessary for building the signal path from

30 A to L can be obtained by a suitable series of D2B request messages to the relevant devices and subdevices. A suitable system for providing such control is described in GB-2 223 114-A1 (PHN 12678). In that system no AVC subdevice requires knowledge of the complete system, only its nearest neighbours.

[0029] In order to provide a user-friendly user interface for the system any AVC subdevice (hereinafter "AVC") may wish to display user messages using the on-screen display (OSD) facility of the UIO subdevice

35 41. For example, when the television is activated by a user and a signal path set up according to the user's wishes, the AVC 24 may wish to conform visually for the user which channel is being watched. If the signal comes from the satellite tuner 10, a conventional on-screen display would be able to confirm no more than the fact that the signal is coming from the second external connector 50. To allow the displayed information to include the actual channel name, known only within AVC

20, a device information process is set up, with the AVC 24 acting as the initiating AVC and AVC 20 acting as an addressed AVC.

[0030] More than one device information process can be pending at one time, each process involving just one initiating AVC and one or more addressed AVCs. Each AVC can be involved in a number of device information processes, acting as initiating AVC in some and addressed AVC in others.

[0031] To implement the device information facility, the following D2B requests and commands are defined for use by an initiating AVC in the system of Figure 1:

- [Character-Sets?] request causes the addressed AVC to reply with a parameter [charset] or list of parameters identifying the supported character sets by reference to a list of standard sets;
- [Device Information Format?] request causes the addressed AVC to reply with a list of format definitions [format] specifying the height and width (in characters) of the user messages that the addressed AVC can compose;
- [Monitor Device Status] command instructs the addressed AVC to compose a user message and has parameters [format] and [charset] to specify the format of the desired user message, and also a control parameter which may be [once], [on] or [off]; and
- [Monitoring Device Status?] request causes the addressed AVC to reply [on] or [off], as described below.

[0032] For all the above requests, a reply [Not Implemented] from the addressed AVC indicates that a device information facility is not implemented by that AVC.

[0033] If the control parameter in the [Monitor Device Status] command is [once], this indicates that only one user message indicating current status is desired, whereas the value [on] indicates that an updated user message is desired in response to each status change until the command is issued again with the control parameter [off].

[0034] For the addressed AVC, the command [Device Information] is defined, with parameters [format], [charset] and [text] which can be sent to the initiating AVC, and includes the user message in the parameter [text]. This is implemented as a command message, rather than a reply to a request, in order that the addressed AVC can volunteer user messages spontaneously in response to subsequent status changes.

[0035] The [Monitoring Device Status?] request is used to find out if an addressed AVC will be returning a user message to the initiating AVC: [on] if so, [off] if not. It should be noted that the answer [off] may be received though a command [Monitor Device Status] [on] has recently been given to the addressed AVC. This is because the addressed AVC has to keep a record of every initiating AVC that awaits an updated user message, for example by storing in a table the device-subdevice ad-

dress of each initiating AVC. If that table becomes full, no further device information processes can use the addressed AVC. The table entry is deleted when the command [Monitor Device Status] [off] is received from the corresponding initiating AVC. It is also desirable that the addressed AVC should delete a table entry if the initiating AVC should become inactive, for example due to an apparatus in the system being switched off.

[0036] Figure 2. illustrates a typical sequence of messages being exchanged between a single initiating AVC at the left hand side, an addressed AVC in the middle and an OSD subdevice at the right hand side. The three vertical lines represent the parallel actions of each of these subdevices respectively, with time increasing from top to bottom. Interactions in the form of D2B messages are represented by arrows directed from one of these lines to another. Steps 200 to 210 relate to a once-only request for device information:

- 20 200 the initiating AVC asks the available character sets, and the addressed AVC replies with a single value [charset];
- 202 The initiating AVC asks the available formats, and the addressed AVC replies with a single format parameter [format], for example "4 lines of 16 characters";
- 204 the initiating AVC issues the command [Monitor Device Status] [once] [format] [charset], and the addressed AVC stores the address of the initiating AVC and begins to prepare the user message in that format;
- 206 the initiating AVC asks if monitoring is in progress, the addressed AVC replies [on];
- 208 the composed user message [text], including the exact number of characters dictated by [format], is sent to the initiating AVC with a [Device Information] command and the stored address of the initiating AVC is 'forgotten';
- 210 the initiating AVC sends the user message [text] to the OSD subdevice for display;

[0037] Steps 220 to 234 relate to a subsequent request for updated user messages;

- 45 220 the initiating AVC issues the command [Monitor Device Status][on][format][charset], indicating that updated user messages are desired, and specifying the text size and character set to be used (available character set and text size are already known from 200,202): the addressed AVC stores the address of the initiating AVC and begins to prepare a first user message;
- 222 the initiating AVC confirms with a [Monitoring Device Status?] request that the addressed AVC is able to produce the requested message (reply=[on]);
- 224 the first user message [text1] is sent to the initiating AVC with a [Device Information] command;

226 the initiating AVC sends the user message [text1] to the OSD subdevice for display with a command [OSD];

228 the addressed AVC detects a change in status and begins preparing an updated user message;

230 the updated user message [text2] is sent to the initiating AVC with a [Device Information] command;

232 the updated user message is sent to the OSD subdevice for display, steps 228-232 occurring in response to each status change so long as the device information process is active;

234 the initiating AVC sends the command [Monitor Device Status] [off], the addressed AVC forgets the stored address of the initiating AVC so that no further updated user messages are supplied for display.

**[0038]** It is of major benefit that the initiating AVC does not need to specify or interpret the content of the user message, and therefore one apparatus does not need to know (that is, acquire and store) a large amount of information about another apparatus in order to initiate the display of user messages. Furthermore, the style and content of the user messages are, within a restricted format, entirely at the choice of the designers of the addressed device. Therefore freedom to design more user-friendly products, and products which express a 'personality' characteristic of a given manufacturer, is not greatly restricted by the need for compatibility of products between manufacturers.

**[0039]** To allow the addressed AVC (or any other AVC) to generate a user message that reflects status information for a subdevice located anywhere in the system, in particular in a different device, requests and commands are also defined relating to the status of an addressed subdevice. For example, it will be more helpful to the user if the VCR device 12 can generate a user message saying "Recording Superchannel", rather than merely "Recording from external connector". To allow this, a command [Monitor Subdevice Status] is defined for the addressed AVC to send to a further subdevice, with parameter [on] or [off]. This has an effect on the further subdevice similar to that of the [Monitor Device Status] command for the addressed AVC, except that the reply [Subdevice Status] from the subdevice comprises status information in a coded form understandable by the AVC, rather than being a natural language text message for the user.

**[0040]** Upon receipt of the command [Monitor Subdevice Status][on], then, the further subdevice stores the device-subdevice address of the addressed AVC and begins to construct the first message [Subdevice Status]. So long as the address of the addressed AVC remains stored in the further subdevice, the latter will send an updated [Subdevice Status] message to that AVC in response to any change in status within the subdevice (for example, a change of channel, a new volume set-

ting, end of tape and so forth). If the further subdevice has room to store more than one AVC address for this purpose, then each such AVC will be sent a [Subdevice Status] message in response to each status change.

5 Thus, the event which triggers an update of the on-screen display at 228 in the sequence of Figure 2 might be the receipt by the addressed AVC of an updated [Subdevice Status] message from a further subdevice (not illustrated in Figure 2).

10 **[0041]** The further subdevice will forget a stored AVC address when it receives the command [Monitor Subdevice Status][off] from that AVC, or if it becomes impossible to send subdevice status information to that AVC, for example because the latter has been switched off, or disconnected from the bus.

**[0042]** The [Subdevice Status] message always conveys the same set of information in the present embodiment: the AVC is not permitted to specify only the subset of this information which is needed at a given time, since that would increase the processing and storage abilities demanded of every further subdevice.

**[0043]** Specific requests are defined however, for the individual properties of the subdevice, for example to find out the brightness or contrast setting of the video monitor subdevice 46, the preset tuning setting of the tuner subdevice 26, 28 or 42. If the updated [Subdevice Status] message does not itself contain a required piece of information, it can at least serve as a prompt to an AVC to ask for that specific property. Once again, the system described has benefits in that the responsibility for determining the content and style of the user messages or other control feature can be concentrated within one AVC, and not distributed among the subdevices of several apparatuses, so as to force restrictive compatibility requirements on different apparatus manufacturers.

**[0044]** It will be appreciated that the subdevice status facilities can be used by an AVC to obtain information for control purposes not necessarily connected with the provision of user-readable messages. For example, if a user wishes to play from the beginning of a tape loaded in the deck subdevice 32 of the VCR 12, an AVC (22 etc.) can issue a REWIND command to the deck subdevice, together with a subdevice status request. When the tape is fully rewound, this will trigger an updated subdevice status message to the AVC, which can then issue a PLAY command without further user intervention.

## 50 Claims

1. A local communication bus system comprising a serial control bus (16) attached to a plurality of addressable devices (10,12,14), each device including at least one functional element addressable via the bus as a subdevice (20,22,24), the subdevices in the system including a user output subdevice (46) for displaying status information of one or more de-

5 vices of the system to a user of the system and a first control subdevice (41) for initiating the display of such status information, the first control subdevice (41) including means for generating a device information request message addressed to a device (10,12) different from the device (14) which contains the first control subdevice (41), and the addressed device including a second control subdevice (27,29) responsive to such a request message for determining the required status information; wherein the second control subdevice is arranged to compose a formatted user-readable message and transmit the user readable message directly or via one or more other control subdevices of the system to the user output subdevice (46) for display, **characterised in that** the first control subdevice (41) is configured to include in the device information request message a field specifying a format for the user-readable message and **in that** the second control subdevice (27,29) is responsive to the said field to compose the user-readable message in accordance with the specified format.

10 2. A system as claimed in Claim 1 wherein the second control subdevice (27,29) transmits the composed user readable message to the first control subdevice (14), and wherein the first control subdevice relays the user readable message to the user output subdevice (46).

15 3. A system as claimed in Claim 1 wherein the first control subdevice (41) is arranged to specify in the said field in the device information request message the format of the desired user readable message by a number and length of lines of characters, and by reference to a specific character set.

20 4. A system as claimed in any preceding claim wherein the second control subdevice (27,29) further includes means responsive to a change in status within the system for composing and transmitting an updated user readable message without the need for a further information request from the first control subdevice (41).

25 5. A system as claimed in Claim 4, wherein the first control subdevice (41) is arranged to include in the device information request message a field specifying whether or not updated user readable messages are desired.

30 6. A system as claimed in Claim 5 wherein the first control subdevice (41) includes means for generating a verification request addressed to the second control subdevice (27,29), the second control subdevice (27,29) being responsive to the verification request message to generate a message advising whether updated user readable messages will be

generated.

35 7. A system as claimed in Claim 1 or 3 wherein the first control subdevice (41) includes means for generating an available formats request message addressed to the second control subdevice (27,29), the second control subdevice being responsive to such a request to return a list of user readable message formats that can be composed by the second control subdevice.

40 8. An apparatus for use as an addressable device (10,12) in a system as claimed in any preceding claim, the apparatus including an interface (20,21) enabling connection to a serial control bus and at least one functional element, the functional element being addressable via the bus, as a control subdevice (27,29) said subdevice comprising means coupled with the interface to receive a device information request message transmitted via the bus; means responsive to such a message to determine certain status information of the device for communication to a user of the system; means arranged to compose a formatted user-readable message conveying the said status information; and transmission means operable to transmit the user readable message directly or via one or more other control subdevices coupled to the bus to a user output subdevice, addressable via the bus, for display thereby; **characterised by** means (27, 29) responsive to the specification of a format for the user-readable message in a field of the device information request message to compose the user-readable message in accordance with the specified format.

45 9. An apparatus as claimed in Claim 8 wherein the functional element (27,29) further includes means arranged to initiate the display of status information by generating and transmitting via the bus a device information request message addressed to a control subdevice (27,29) in a different apparatus coupled to the bus.

#### 45 Patentansprüche

1. Lokales Bus-Kommunikationssystem mit einem seriellen Steuerbus (16), der mit einer Vielzahl von adressierbaren Geräten (10, 12, 14) verbunden ist, wobei jedes Gerät mindestens ein funktionelles Element enthält, das über den Bus als ein Teilgerät (20, 22, 24) adressierbar ist und wobei die Teilgeräte in dem System ein Benutzerausgabe-Teilgerät (46) zum Anzeigen von Statusinformationen von einem oder mehreren Geräten des Systems für einen Benutzer des Systems enthalten und ein erstes Steuerungsteilgerät (41) zum Initiieren der Anzeige von solchen Statusinformationen, wobei das erste

Steuerungsteilgerät (41) Mittel zum Erzeugen einer Geräteinformations-Anforderungsmeldung enthält, die an ein anderes Gerät (10, 12) adressiert wird als an jenes (14), das das erste Steuerungsteilgerät (41) enthält, und wobei das adressierte Gerät ein zweites Steuerungsteilgerät (27, 29) enthält, das auf eine solche Anforderungsmeldung reagiert, um die gewünschten Statusinformationen zu bestimmen, wobei das zweite Steuerungsteilgerät so angeordnet ist, daß eine formatierte benutzerlesbare Meldung zusammengestellt wird und daß die benutzerlesbare Meldung unmittelbar oder über eines oder mehrere Steuerungsteilgeräte des Systems an das Benutzeroausgabe-Teilgerät (46) zur Anzeige gesendet wird, **dadurch gekennzeichnet**, dass das erste Steuerungsteilgerät (41) so konfiguriert ist, daß es in der Geräteinformations-Anforderungsmeldung ein Feld enthält, welches ein Format für die benutzerlesbare Meldung spezifiziert, und dass das zweite Steuerungsteilgerät (27, 29) auf das genannte Feld reagiert, um die benutzerlesbare Meldung in Übereinstimmung mit dem spezifizierten Format zusammenzustellen.

5. System nach Anspruch 1 oder 3, wobei das erste Steuerungsteilgerät (41) Mittel zum Erzeugen einer Anforderungsmeldung für verfügbare Formate enthält, die an das zweite Steuerungsteilgerät (27, 29) adressiert wird, wobei das zweite Steuerungsteilgerät auf eine solche Anforderung reagiert, um eine Liste von zusammenstellbaren Formaten für die benutzerlesbare Meldung zurückzuschicken.

10. System nach Anspruch 1 oder 3, wobei das erste Steuerungsteilgerät (41) Mittel zum Erzeugen einer Anforderungsmeldung für verfügbare Formate enthält, die an das zweite Steuerungsteilgerät (27, 29) adressiert wird, wobei das zweite Steuerungsteilgerät auf eine solche Anforderung reagiert, um eine Liste von zusammenstellbaren Formaten für die benutzerlesbare Meldung zurückzuschicken.

15. System nach Anspruch 1 oder 3, wobei das erste Steuerungsteilgerät (41) so angeordnet ist, daß es in dem genannten Feld in der Geräteinformations-Anforderungsmeldung das Format der gewünschten benutzerlesbaren Meldung durch die Anzahl und Länge von Zeilen oder Zeichen und durch Verweis auf einen bestimmten Zeichensatz spezifiziert.

20. System nach Anspruch 1, wobei das zweite Steuerungsteilgerät (27, 29) die zusammengestellte benutzerlesbare Meldung an das erste Steuerungsteilgerät (41) überträgt und wobei das erste Steuerungsteilgerät die benutzerlesbare Meldung an das Benutzeroausgabe-Teilgerät (46) weiterleitet.

25. System nach Anspruch 1, wobei das erste Steuerungsteilgerät (41) so angeordnet ist, daß es in dem genannten Feld in der Geräteinformations-Anforderungsmeldung das Format der gewünschten benutzerlesbaren Meldung durch die Anzahl und Länge von Zeilen oder Zeichen und durch Verweis auf einen bestimmten Zeichensatz spezifiziert.

30. System nach Anspruch 1, wobei das erste Steuerungsteilgerät (41) so angeordnet ist, daß es in dem genannten Feld in der Geräteinformations-Anforderungsmeldung das Format der gewünschten benutzerlesbaren Meldung durch die Anzahl und Länge von Zeilen oder Zeichen und durch Verweis auf einen bestimmten Zeichensatz spezifiziert.

35. System nach Anspruch 1, wobei das erste Steuerungsteilgerät (41) so angeordnet ist, daß es in dem genannten Feld in der Geräteinformations-Anforderungsmeldung das Format der gewünschten benutzerlesbaren Meldung durch die Anzahl und Länge von Zeilen oder Zeichen und durch Verweis auf einen bestimmten Zeichensatz spezifiziert.

40. System nach einem der vorhergehenden Ansprüche, wobei das zweite Steuerungsteilgerät (27, 29) außerdem Mittel enthält, die auf eine Änderung des Status innerhalb des Systems reagieren, um eine aktualisierte benutzerlesbare Meldung zu erstellen und zu übertragen, ohne daß eine weitere Informationsanforderung vom ersten Steuerungsteilgerät (41) erforderlich ist.

45. System nach Anspruch 4, wobei das erste Steuerungsteilgerät (41) so angeordnet ist, daß es in der Geräteinformations-Anforderungsmeldung ein Feld enthält, welches spezifiziert, ob aktualisierte benutzerlesbare Meldungen gewünscht werden oder nicht.

50. System nach Anspruch 5, wobei das erste Steuerungsteilgerät (41) Mittel zum Erzeugen einer Verifizierungsanforderung enthält, die an das zweite Steuerungsteilgerät (27, 29) adressiert wird, wobei das zweite Steuerungsteilgerät (27, 29) adressiert wird, wobei das zweite Steuerungsteilgerät (27, 29) auf die Verifizierungsanforderungsmeldung reagiert, um eine Meldung zu erzeugen, die angibt, ob aktualisierte benutzerlesbare Meldungen erzeugt werden.

55. System nach Anspruch 1 oder 3, wobei das erste Steuerungsteilgerät (41) Mittel zum Erzeugen einer Anforderungsmeldung für verfügbare Formate enthält, die an das zweite Steuerungsteilgerät (27, 29) adressiert wird, wobei das zweite Steuerungsteilgerät auf eine solche Anforderung reagiert, um eine Liste von zusammenstellbaren Formaten für die benutzerlesbare Meldung zurückzuschicken.

8. Vorrichtung zur Verwendung als ein adressierbares Gerät (10, 12) in einem System nach jedem vorhergehenden Anspruch, wobei die Vorrichtung eine Schnittstelle (20, 21) enthält, die die Verbindung mit einem seriellen Steuerbus und mindestens einem funktionellen Element ermöglicht, wobei das funktionelle Element über den Bus als ein Steuerungsteilgerät (27, 29) adressierbar ist, wobei das genannte Teilgerät folgendes enthält: Mittel, die mit der Schnittstelle verbunden sind, um eine Geräteinformations-Anforderungsmeldung zu empfangen, die über den Bus übertragen wird; Mittel, die auf eine solche Meldung reagieren, um bestimmte Statusinformationen des Gerätes zur Mitteilung an einen Benutzer des Systems zu bestimmen; Mittel, die so angeordnet sind, daß eine formatierte benutzerlesbare Meldung zusammengestellt wird, welche die genannten Statusinformationen enthält; und Übertragungsmittel, um die benutzerlesbare Meldung direkt oder über ein oder mehrere andere mit dem Bus verbundene Steuerungsteilgeräte an ein Benutzeroausgabe-Teilgerät zu übertragen, das über den Bus zur Anzeige adressierbar ist; **gekennzeichnet durch** Mittel (27, 20), die auf die Spezifikation eines Formats für die benutzerlesbare Meldung in einem Feld der Geräteinformations-Anforderungsmeldung reagieren, um gemäß dem spezifizierten Format die benutzerlesbare Meldung zusammenzustellen.

9. Vorrichtung nach Anspruch 8, wobei das funktionelle Element (27, 29) außerdem Mittel enthält, die so angeordnet sind, daß sie die Anzeige von Statusinformation durch Erzeugen einer an ein Steuerungsteilgerät (27, 29) in einer anderen mit diesem Bus verbundenen Vorrichtung adressierten Geräteinformations-Anforderungsmeldung und das Übertragen dieser Meldung über den Bus initieren.

## Revendications

1. Système de bus de communication local compre-

nant un bus de commande série (16) connecté à une pluralité de dispositifs adressables (10, 12, 14), chaque dispositif comprenant au moins un élément fonctionnel adressable via le bus en tant que sous-dispositif (20, 22, 24), les sous-dispositifs dans le système comprenant un sous-dispositif de sortie utilisateur (46) pour afficher l'information d'état d'un ou de plusieurs dispositifs du système à un utilisateur du système et un premier sous-dispositif de commande (41) pour amorcer l'affichage de cette information d'état, le premier sous-dispositif de commande (41) comprenant des moyens pour générer un message de demande d'information de dispositif adressé à un dispositif (10; 12) différent du dispositif (14) qui contient le premier sous-dispositif de commande (41), et le dispositif adressé comprenant un deuxième sous-dispositif de commande (27, 29) réagissant à ce message de demande pour déterminer l'information d'état requise où le deuxième sous-dispositif de commande est à même de composer un message formaté lisible par l'utilisateur et de transmettre le message lisible par l'utilisateur directement ou via un ou plusieurs autres sous-dispositifs de commande du système au sous-dispositif de sortie utilisateur (46) en vue de l'affichage, **caractérisé en ce que** le premier sous-dispositif de commande (41) est configuré de manière à inclure dans le message de demande d'information du dispositif un champ spécifiant un format pour le message lisible par l'utilisateur et **en ce que** le deuxième sous-dispositif de commande (27, 29) réagit audit champ pour composer le message lisible par l'utilisateur conformément au format spécifié.

2. Système suivant la revendication 1, dans lequel le deuxième sous-dispositif de commande (27, 29) transmet le message composé lisible par l'utilisateur au premier sous-dispositif de commande (41), et dans lequel le premier sous-dispositif de commande relaie le message lisible par l'utilisateur au sous-dispositif de sortie utilisateur (46).

3. Système suivant la revendication 1, dans lequel le premier sous-dispositif de commande (41) est à même de spécifier dans ledit champ dans le message de demande d'information de dispositif le format du message souhaité lisible par l'utilisateur par un nombre et une longueur de lignes de caractères, et par référence à un jeu de caractères spécifique.

4. Système suivant l'une quelconque des revendications précédentes, dans lequel le deuxième sous-dispositif de commande (27, 29) comprend en outre des moyens réagissant à un changement d'état dans le système pour composer et transmettre un message lisible par l'utilisateur remis à jour sans qu'une demande d'information supplémentaire en provenance du premier sous-dispositif de commande (41) ne soit nécessaire.

5. Système suivant la revendication 4, dans lequel le premier sous-dispositif de commande (41) est à même d'inclure dans le message de demande d'information de dispositif un champ spécifiant si des messages remis à jour lisibles par l'utilisateur sont souhaités ou non.

6. Système suivant la revendication 5, dans lequel le premier sous-dispositif de commande (41) comprend des moyens destinés à générer une demande de vérification adressée au deuxième sous-dispositif de commande (27, 29), le deuxième sous-dispositif de commande (27, 29) réagissant au message de demande de vérification pour générer un message prévenant si des messages remis à jour lisibles par l'utilisateur seront générés.

7. Système suivant la revendication 1 ou 3, dans lequel le premier sous-dispositif de commande (41) comprend des moyens pour générer un message de demande de formats disponibles adressé au deuxième sous-dispositif de commande (27, 29), le deuxième sous-dispositif de commande réagissant à une telle demande pour renvoyer une liste de formats de messages lisibles par l'utilisateur qui peuvent être composés par le deuxième sous-dispositif de commande.

8. Appareil propre à être utilisé en tant que dispositif adressable (10, 12) dans un système suivant l'une quelconque des revendications précédentes, l'appareil comprenant une interface (20, 21) permettant la connexion à un bus de commande série et au moins un élément fonctionnel, l'élément fonctionnel étant adressable via le bus comme un sous-dispositif de commande (27, 29), ledit sous-dispositif comprenant des moyens couplés à l'interface pour recevoir un message de demande d'information de dispositif transmis via le bus; des moyens réagissant à un tel message pour déterminer une certaine information d'état en vue de la communication à un utilisateur du système; des moyens à même de composer un message formaté lisible par l'utilisateur acheminant ladite information d'état; et des moyens de transmission pouvant servir à transmettre le message lisible par l'utilisateur directement ou via un ou plusieurs autres sous-dispositifs de commande couplés au bus à un sous-dispositif de sortie de l'utilisateur, adressable via le bus, en vue de l'affichage, **caractérisé par** des moyens (27, 29) réagissant à la spécification d'un format pour le message lisible par l'utilisateur dans un champ du message de demande d'information de dispositif pour composer le message lisible par l'utilisateur conformément au format spécifié.

9. Appareil suivant la revendication 8, dans lequel l'élément fonctionnel (27, 29) comprend en outre des moyens à même d'amorcer l'affichage de l'information d'état en générant et en transmettant via le bus un message de demande d'information de dispositif adressé à un sous-dispositif de commande (27, 29) dans un appareil différent couplé au bus.

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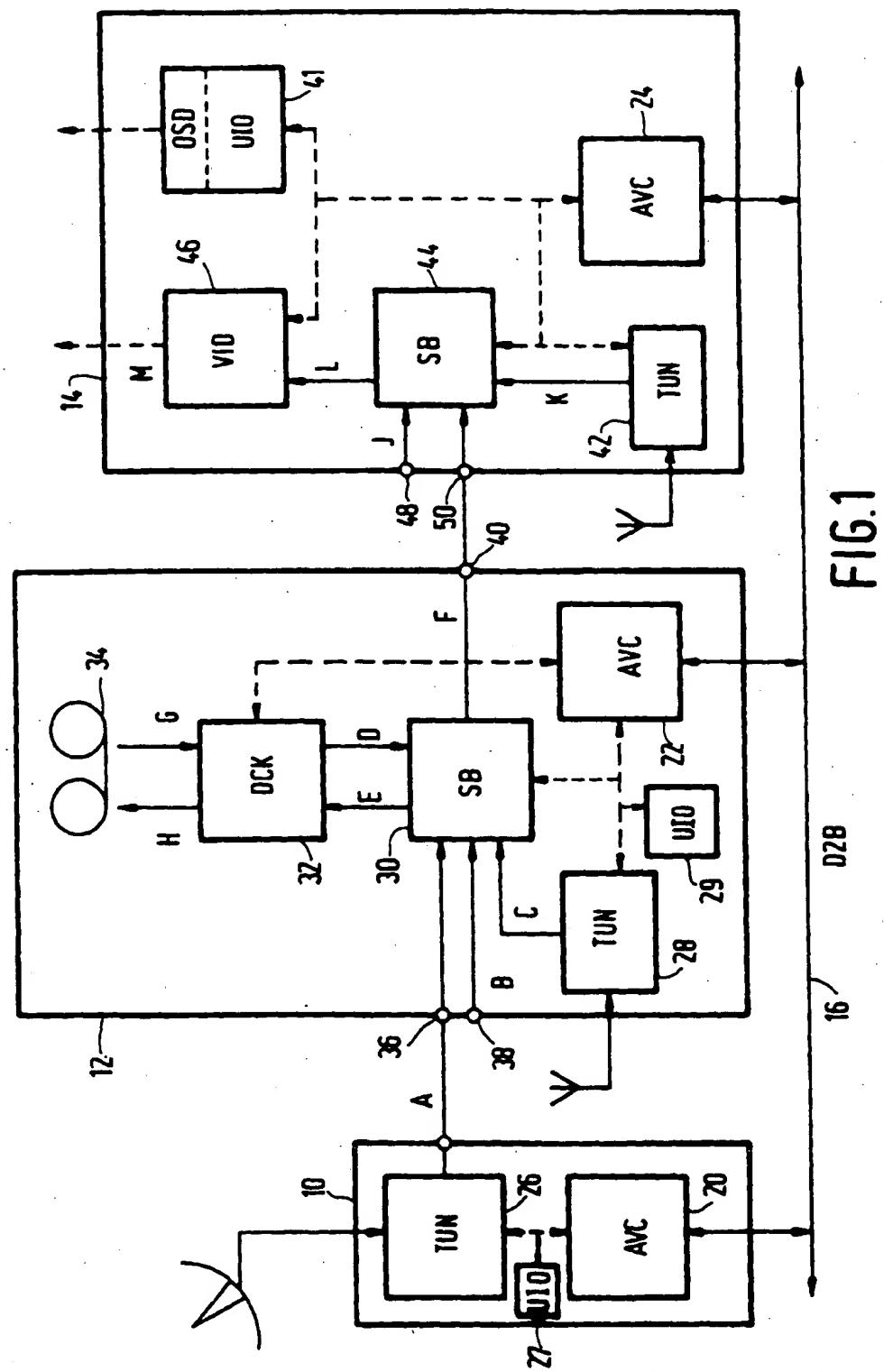
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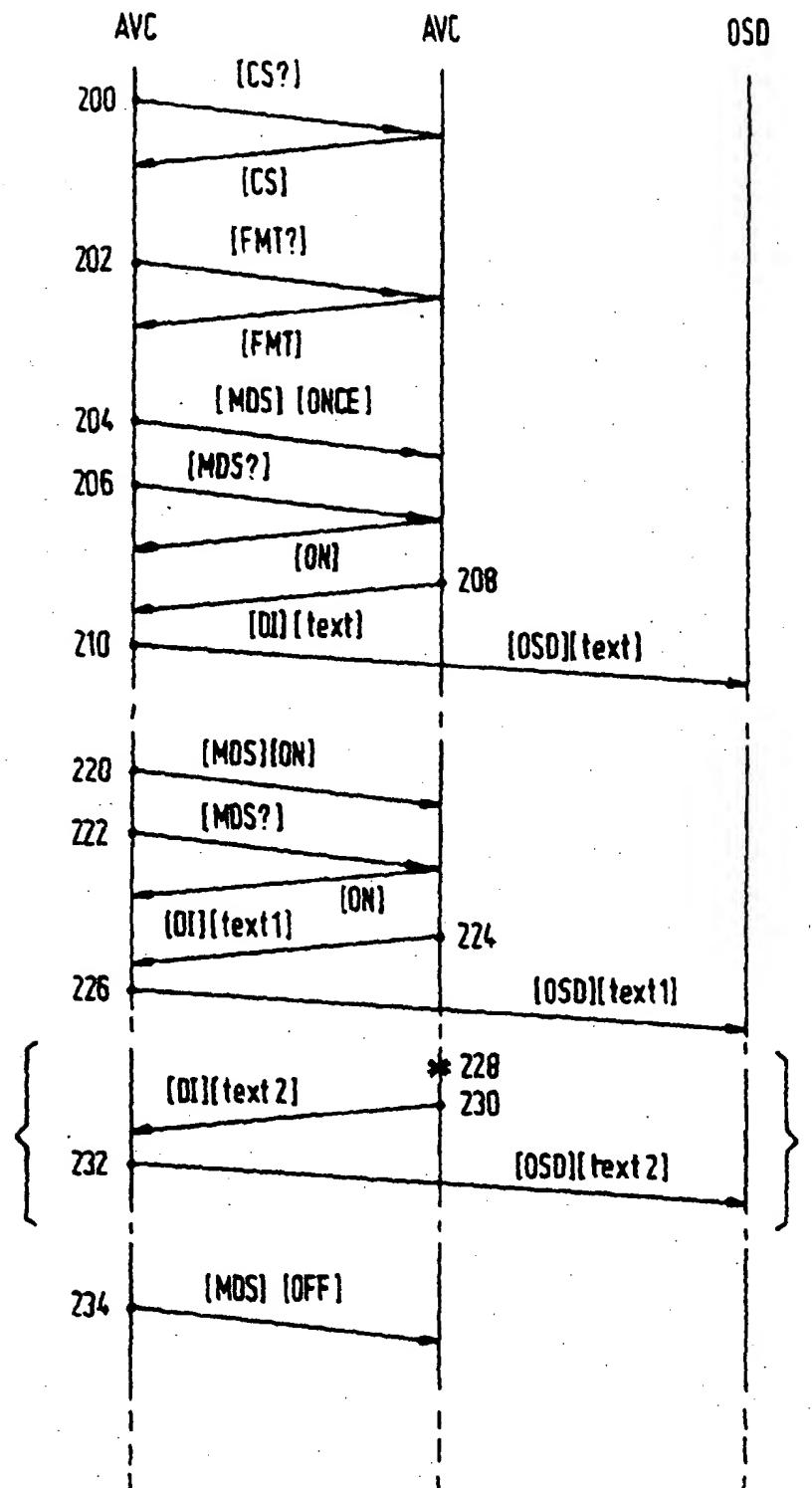


FIG.2